INSTALLATION MANUAL FOR

CANMET

VENTURI EXHAUST SYSTEM

Work on this project was conducted under the auspices of the Canada Center for Mineral and Energy Technology, Energy, Mines and Resources, Canada.

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by Anthony Branje, P. Eng., for Jarvis Clark Ltd.

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1 - INTRODUCTION

This manual has been prepared to allow skilled tradesmen to install the Canmet Venturi Exhaust System on a LHD-JS-500 scoop equipped with a Deutz F8L - 413 engine and the 24 volt electric start option. The exhaust system also includes a recirculating system which will increase the endurance limit of the self contained water supply.

Before beginning with the installation instructions, a brief explanation of the system is in order. With the engine off or at idle speed, all systems are de-energized and non-functioning. As the operator pushes on the accelerator pedal to increase the engine speed, he activates a pressure switch which has been tee'd into the air-line connecting the accelerator pedal to the throttle actuator (pneumatically powered). Above a preset level, for example 10 psi, the pressure switch will energize the exhaust system. The exhaust system has two basic stages.

The first basic stage is the water injection by the high pressure pump, which immediately begins pumping water from the two tanks located in the outriggers to the venturi which is installed in the exhaust system downstream from the engine's exhaust manifold. The location of the each of these components is given in section 2.

The second stage is the recirculating system. Its objective is to transfer soot-contaminated water from the mist eliminator to the water tanks for re-injection into the venturi. The mist eliminator is downstream from the venturi, and it separates the soot-contaminated water droplets from the gas stream, thereby ...

...preventing the unevaporated water droplets from escaping to the atmosphere.

The recirculating system uses short alternating pulses of pressurized air to move the sooty water to the water tanks for reinjection into the venturi. This pulsing action is achieved by the use of a timing relay which alternately energizes and de-energizes three solenoid valves. In the de-energized state, water is allowed to move by gravity to the transfer line. The transfer line is eight feet of hose which is lying below the level of the exit on the mist eliminator. In the energized state, pressurized air forces the collected water into the tank and through the sump filter which is situated inside one of the tanks.

If further clarification is required on the operation of this system, please refer to the draft report which was submitted to the scientific authority indicated on the first page.

2 - INSTALLATION AND LOCATION OF MAJOUR COMPONENTRY

This section will itemize each of the majour components supplied by Jarvis Clark for this project, and indicate either verbally or through drawings and schematics where each is located. (See ARF 141 for parts breakdown).

1 - Pump, motor, bushing unit - located in the skirt between the water tank and the mist eliminator. See drawing 240089 - E (Appendix f) for location.

2 - Relief valve - located downstream from the pump. See sec. 3, plumbing schematic.

3 - Strainer - located upstream from the pump inlet. See sec. 3, Plumbing schematic.

4 - Selector switch, contact block, box - located on the fender directly adjacent to the venturi. See electrical diagram sec. 6.

5 - RH Tank Assy - located in the RH Skirt, See drawing 240088 - D, RH Side View, Appendix e.

6 - LH Tank Assy - located in the LH Skirt, see drawing 240089 - E, LH Side View, Appendix f.

7 - Venturi Weld't - located in the LH Skirt, see drawing 240089 - E, LH Side View, Appendix f.

8 - Mist Eliminator Assy - located in the LH Skirt, see drawing 240089 - E LH Side View, Appendix f.

9 - Timing Relay - located in the Instrument panel in the operator's compartment. See Electrical Schematic sec. 6.

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- b. R.H. Tank Rework - 240085 - D
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JARVIS CLARK COMPANY

CANMET, PROJECT 14 SQ. 23440-0-9164

MISCELLANEOUS HOSES, FITTINGS AND COMPONENTS

JC PART NO.	QUANTITY	DESCRIPTION
115182-A	1	STARTER RELAY
100632-A	1	10 AMP BREAKER
110863-A	1	20 AMP BREAKER
100647-A	1	RED LAMP
107802-A	1	11 PIN SOCKET USED WITH STARTER RELAY
100865-A	6	HYD. FITTING 2081-6-4S
102266-A	4	HYD. FITTING 2081-8-4S
101477-A	4	HYD. FITTING 2081-8-6S
100696-A	10	HYD. FITTING 2021-4-4S
101314-A	6	HYD. FITTING 2021-6-4S
106187-A	6	HYD. FITTING 2021-6-8S
102264-A	1	HYD. FITTING 2091-4-4S
100028-A	2	HYD. FITTING 2083-8-8S
101659-A	2	HYD. FITTING 2083-4-4S
101316-A	2	HYD. FITTING 2083-6-6S
102318-A	2	HYD. FITTING 2091-6-6S
109604-A	2	HYD. FITTING 2091-8-8S
100437-A	2	HYD. FITTING 2021-8-8S
100069-A	1	#8 HOSE, 2 FT. LONG, STR. FITTING BOTH ENDS
110641-A	1	#8 HOSE, 8 FT. LONG, STR. FITTING BOTH ENDS
103828-A	1	#4 HOSE, 4 FT. LONG, STR. FITTING BOTH ENDS
-	1	ROLL OF AUTOMOTIVE WIRE
-	3	ROLLS ELECTRICAL TAPE

1 - INTRODUCTION

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5 - RH Tank Assy - located in the RH Skirt, See drawing 240088 - D, RH Side View, Appendix e.

6 - LH Tank Assy - located in the LH Skirt, see drawing 240089 - E, LH Side View, Appendix f.

7 - Venturi Weld't - located in the LH Skirt, see drawing 240089 - E LH Side View, Appendix f.

8 - Mist Eliminator Assy - located in the LH Skirt, see drawing 240089 - E LH Side View, Appendix f.

9 - Timing Relay - located in the Instrument panel in the operator's compartment. See Electrical Schematic sec. 6.

10 - Filter - located inside the RH Tank Assy. See drawing 240084 - D RH Tank Assy, Appendix a.

11.- Float Switch - located inside each Tank Assy. See drawings 240084 - D RH Tank Assy, Appendix a, and 240086 - D LH Tank Assy, Appendix c.

12 - Filter Housing - located inside RH Tank Assy, see drawing 240084 - D, RH Tank Assy, Appendix a.

13 - Level Switch Weld't - located in each Tank assy, see drawings 240084 - D, RH Tank Assy, Appendix a, and 240086 - D, LH Tank Assy, Appendix c.

14 - Cover Plate Weld't - located in the RH Tank Assy, see drawing 240084 - D, Appendix a.

15 - Housing Weld't - located in each tank weld't, see drawings 240085 - D, RH Tank Rework, Appendix b, and 240087 - D, LH Tank Rework, Appendix d.

16 - Filter Cover - located in the RH Tank Assy, see drawing 240084 - D Appendix a.

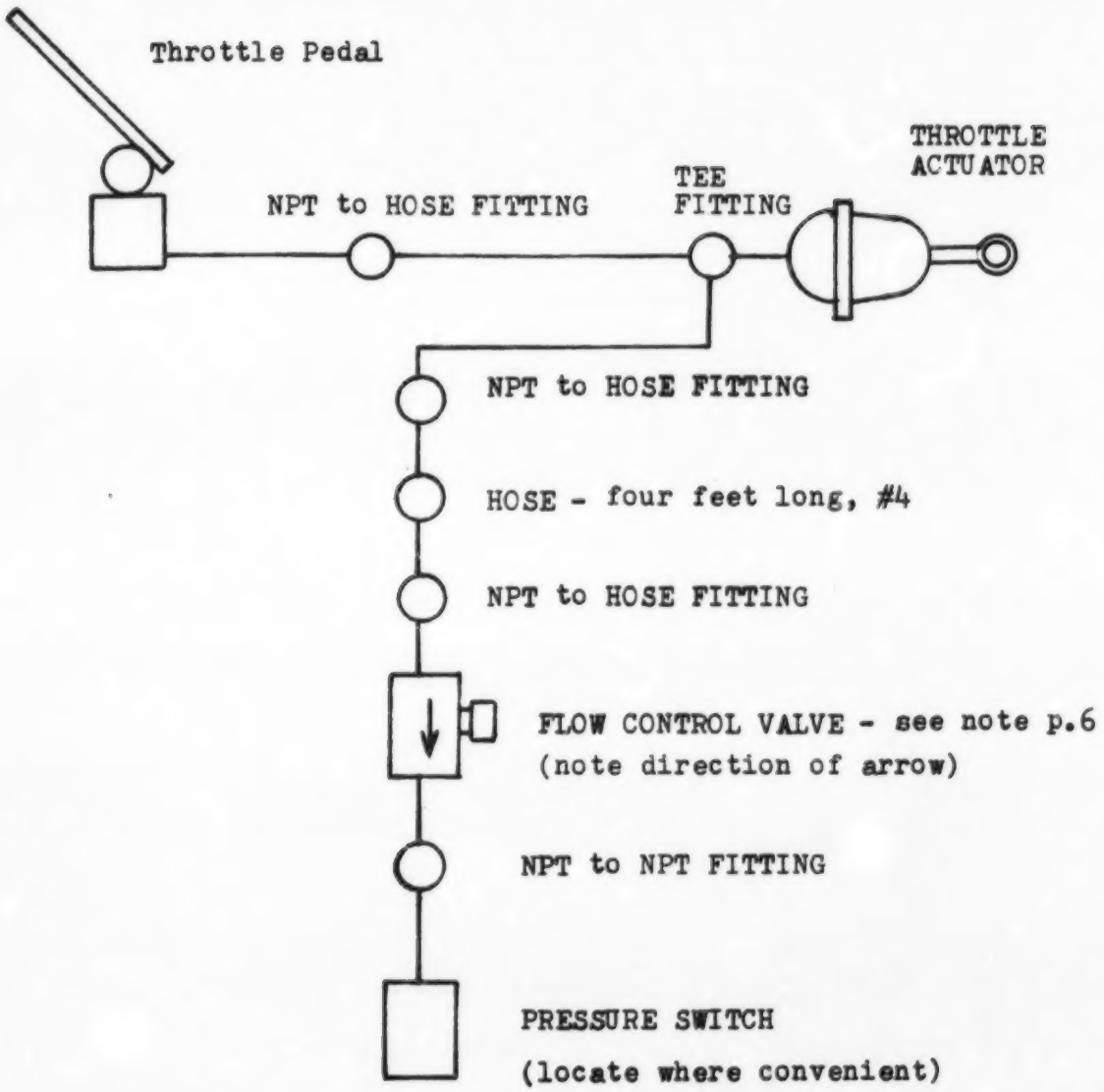
17 - Pressure Cap - located in the RH Tank Assy, see drawing 240084 - D, Appendix a.

18 - Starter Relay and 11 Pin Socket - located in the Instrument Panel in the Operator's Compartment, see Electrical Schematic, Sec. 6.

19 - Red Lamp - located on the instrument panel in a vacant hole.

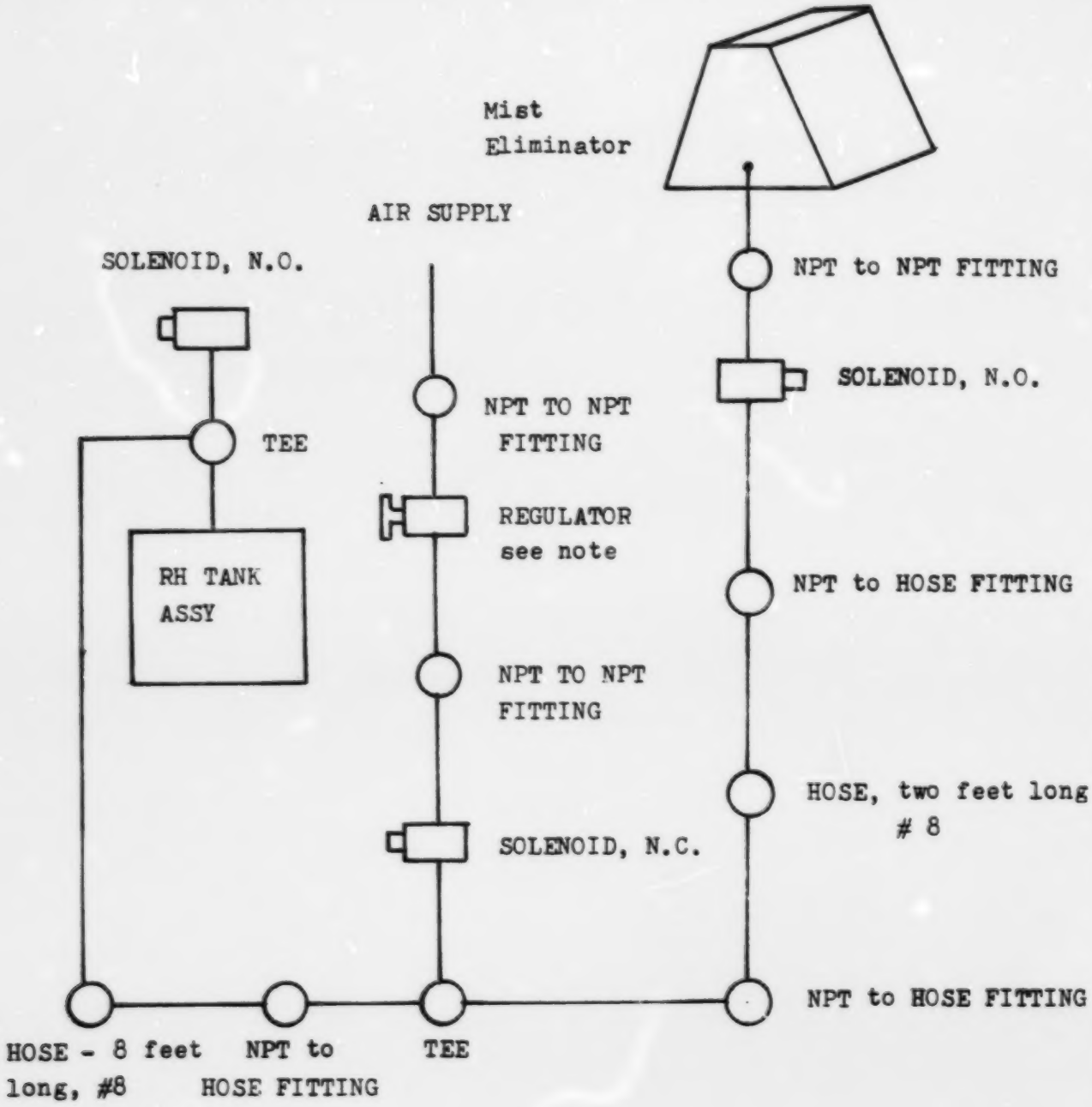
20 - Breakers, 20a and 10a - located in the instrument, see Electrical System Layout, Appendix g.

3 - PLUMBING SCHEMATIC -PNEUMATIC



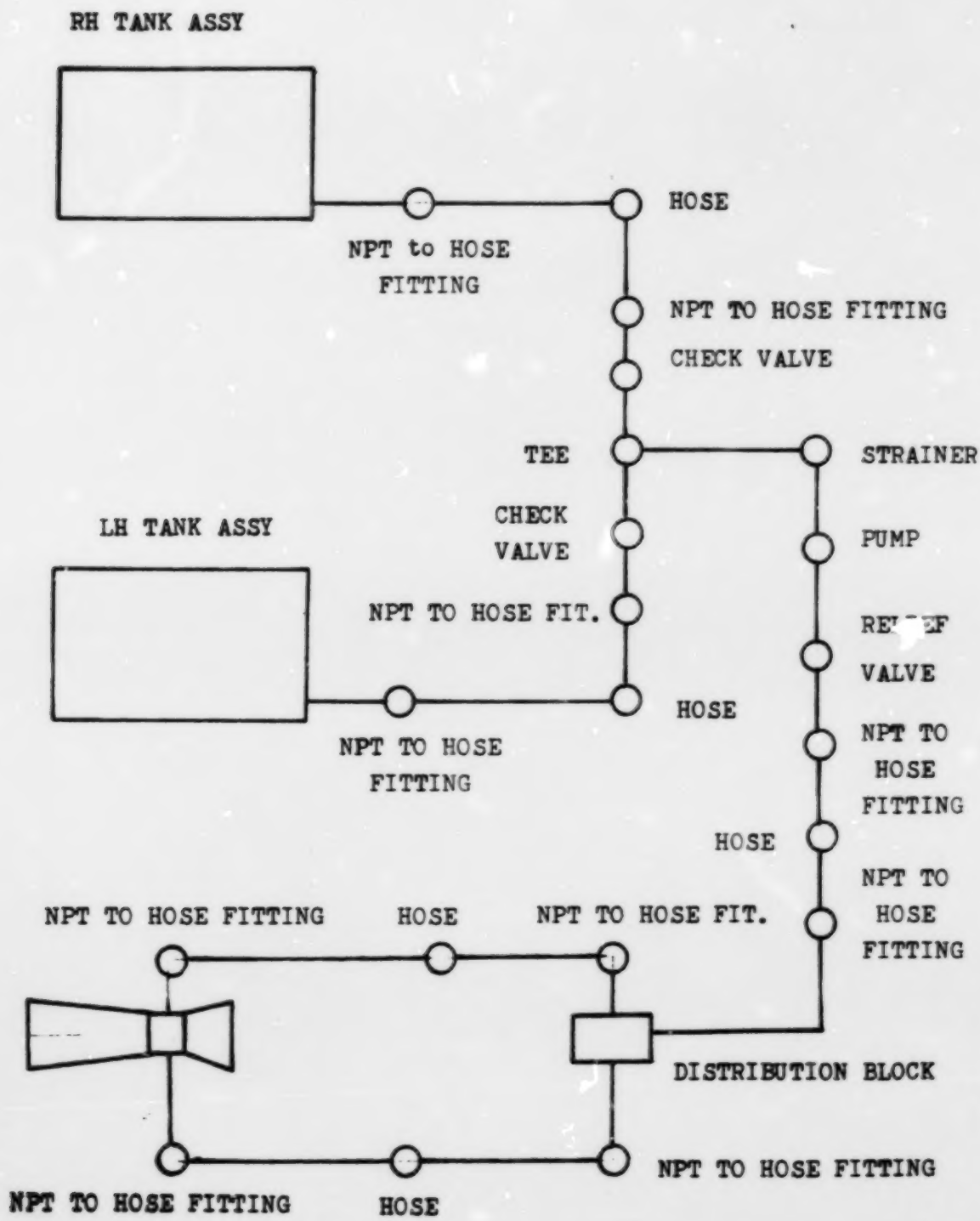
Note : The flow control valve has been included in the pneumatic system to act as a dampener for the following reason : in a typical LHD cycle, the operator is constantly 'milking' the throttle to maintain efficient operation of the scoop. In order to isolate the electrical system from this repetitive loading and unloading, the flow control valve allows controlled and timed depressurization of the pressure switch. Therefore, depending on the setting on the valve, the pressure switch will de-pressurize either quickly after the operator removes his foot from the accelerator pedal, or slowly. The exact setting of the flow control valve can only be determined by trial and error on a field or lab setup. If the exhaust control system is shutting off and on too frequently, close down the flow control valve. If the exhaust system is cycling for an extended period after the engine is set at idle, open up the flow control valve. Experimentation in the lab and field will indicate which setting is the most practical.

4 - PLUMBING SCHEMATIC - WATER RECYCLING.

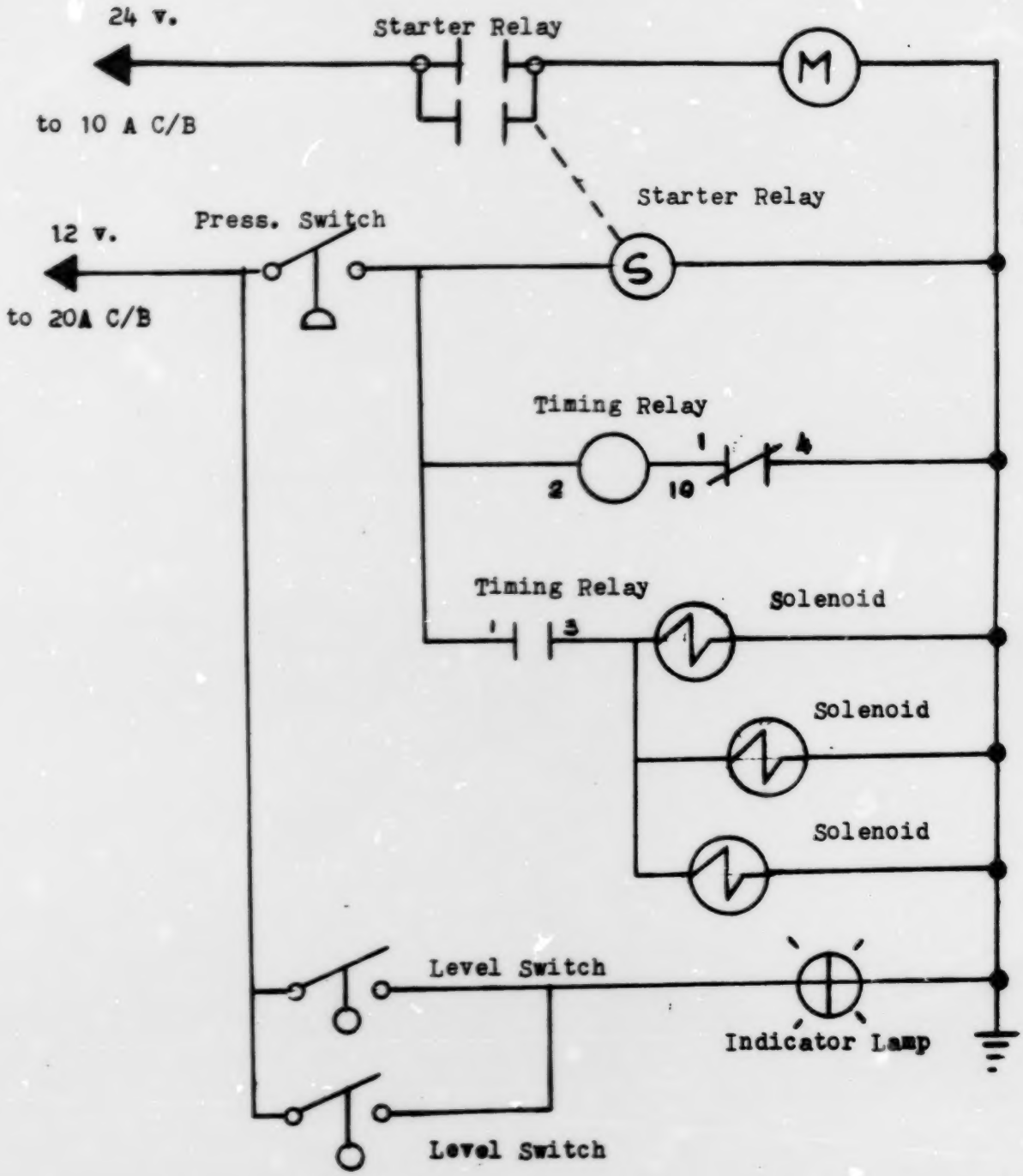


Note : Pressure regulator is to be initially set at 7 psi. If 7 psi does not clear the charge line, increase the pressure by one pound increments. Only trial and error will indicate which pressure setting results in the most efficient transfer of water from the mist eliminator to the filter in the RH tank.

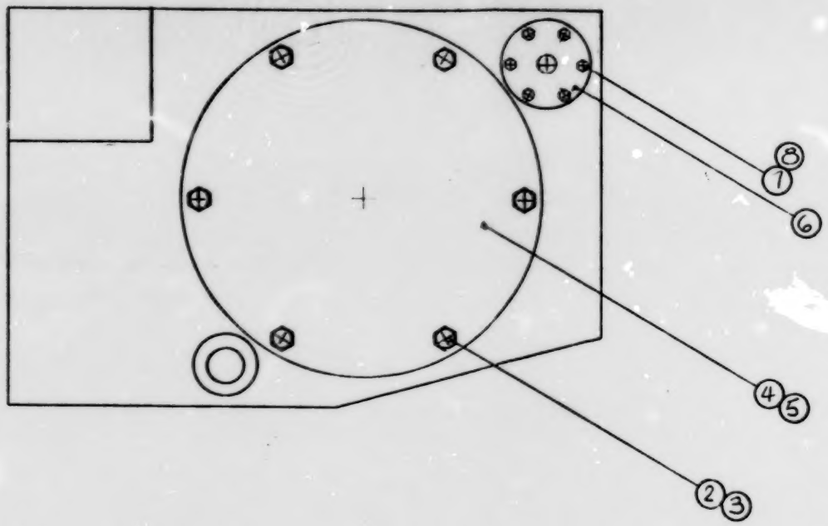
5 - PLUMBING SCHEMATIC -WATER INJECTION

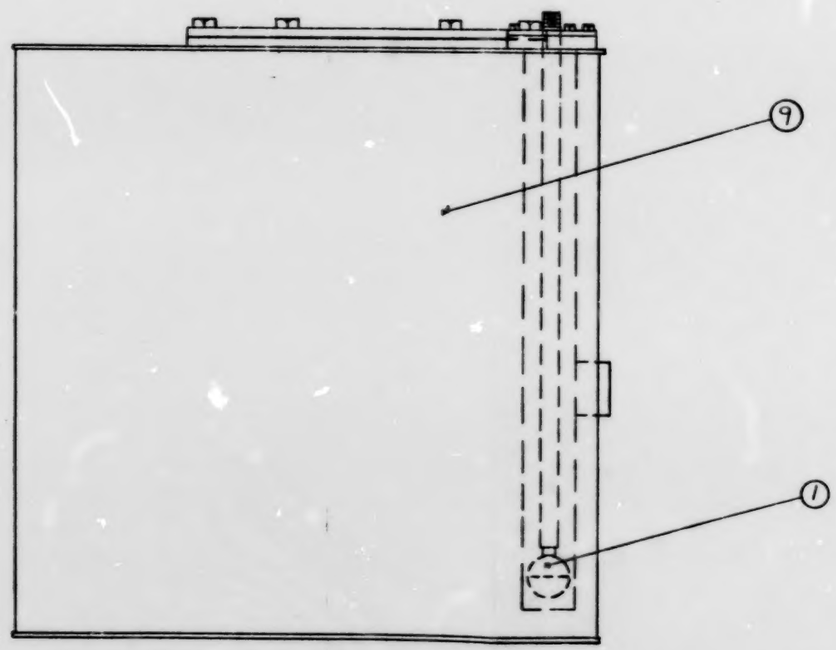


6 - ELECTRICAL SCHEMATIC



Note : Timing Relay to be initially set at : 20 seconds off and 3 seconds on. If the charge line is not clearing when the timing relay has been adjusted as indicated above, increase the on time. If the mist eliminator is flooding, ie. water is seen to be flowing from the exhaust gas outlet, increase the off time. Only trial and error on a lab setup will indicate which combination of on and off times will yield the most efficient transfer of water from the mist eliminator to the tank. The adjusting knobs for on and off times are on the front of the relay and are clearly marked.





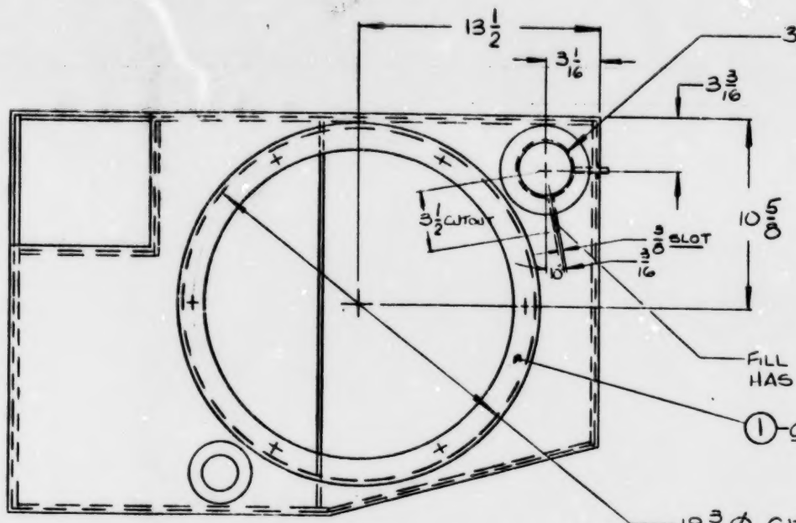
QTY.	ITEM NO	PART NO	DESCRIPTION
1	9	240087-D	LH TANK REWORK
6	8	———	¼ ID LOCKWASHER
6	7	———	¼-UNC HHCS x ½ LG
1	6	230374-B	LEVEL SW WELDT
1	5		COVER PLATE GASKET
1	4	238376-B	COVER PLATE WELDT
6	3	———	½-ID LOCKWASHER
6	2	———	½-13 UNC-HHCS x 1" LG
1	1	103191-A	LEVEL SWITCH

DO NOT SCALE DRAWING
GEN. SPECIFICATIONS
UNLESS OTHERWISE SPECIFIED
INTERPRET THIS DRAWING AS PER CSA SPECIFICATION NUMBER B78.3
BREAK ALL SHARP EDGES.
TOLERANCE — FRACTIONS — ±1/64, ±1/32, ±1/16, ±1/8
DECIMALS — .X ±.1, .XX ±.05, .XXX ±.010
16 FINISH — 125

JARVIS CLARK
NORTH BAY ONTARIO

DR'N BRAUE DATE 10.83
CHK'D SCALE 1/4
APP'D WT.
SHEET NO. OF
USED ON CANMET
JOB NO.

TITLE LH. TANK ASSY
DWG. NO. 240086

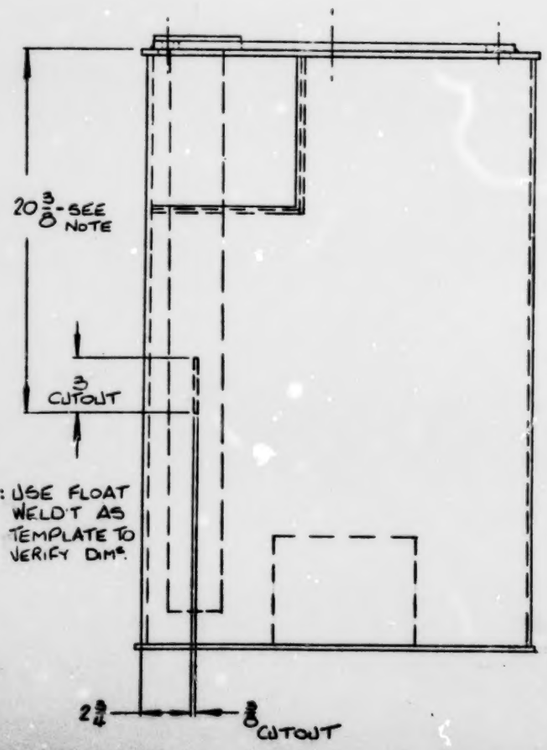


3 1/8 ϕ CUTOUT FOR FLOAT HOUSING. USE WELD'T AS TEMPLATE TO VERIFY DIM'S AND ENSURE THAT HOUSING CLEARS ACCESS FLANGE.

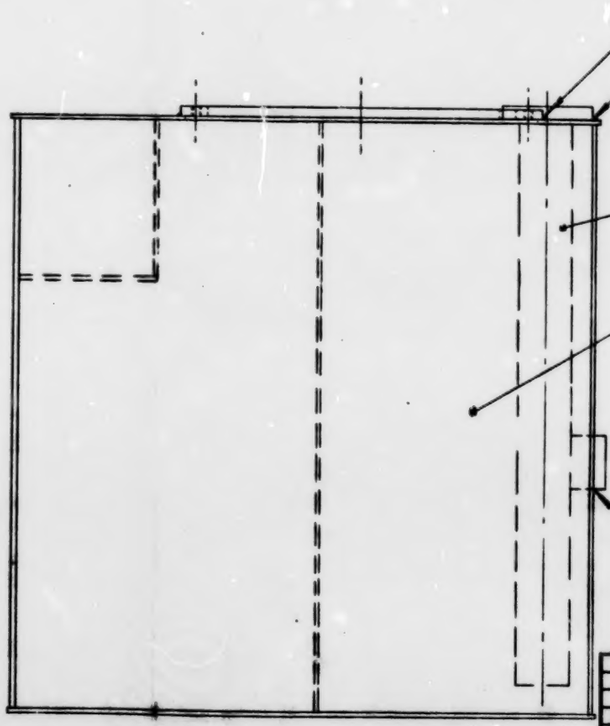
FILL SLOT WITH WELD AFTER FLOAT HOUSING HAS BEEN INSTALLED.

① CENTRALIZE OVER CUTOUT

19 3/4 ϕ CUTOUT - TOP OF TANK - BEFORE CUTTING TANK, LAYOUT ACCESS FLANGE AND FLOAT HOUSING TO ENSURE NO INTERFERENCE.



NOTE: USE FLOAT WELD'T AS TEMPLATE TO VERIFY DIM'S.



INTERIOR OF TANK AND ACCESS COVER TO BE COATED WITH AQUAPON WATER PROOFING COMPOUND. AVAILABLE FROM PITTSBURGH PAINTS. FOLLOW APPLICATION DIRECTIONS IN ATTACHED BROCHURE.

QTY.	ITEM NO.	PART NO.	DESCRIPTION
1	2	233380-A	HOUSING WELD'T
1	1	233379-B	FLANGE

DO NOT SCALE DRAWING

GEN. SPECIFICATIONS

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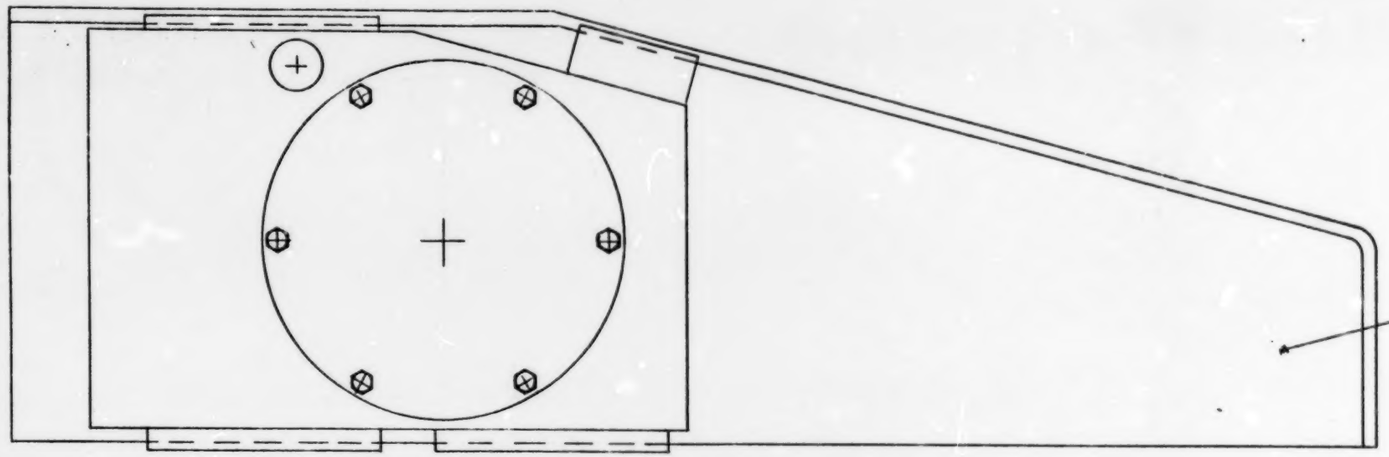
DWN. BRANJE DATE 10.83

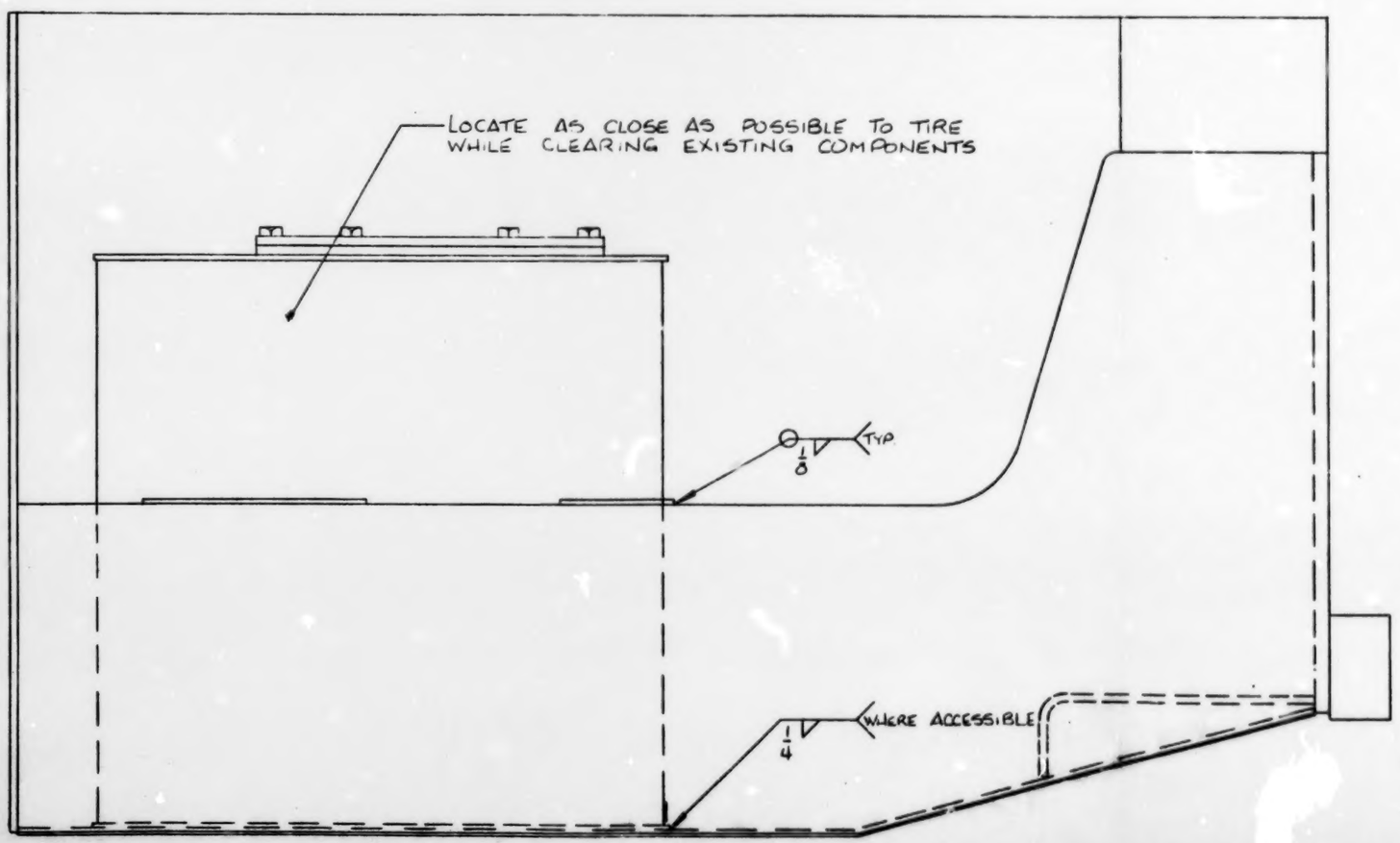
CANMET

LH TANK REWORK

240087



RH SKIRT



NOTE: DRAWING MAY NOT BE PICTORIALLY CORRECT SINCE JS-500 MAY HAVE BEEN EXTENSIVELY REDESIGNED AFTER THE DATE ON THIS DRAWING. REVISE FITTING PROCEEDURE TO SUIT FRAME.

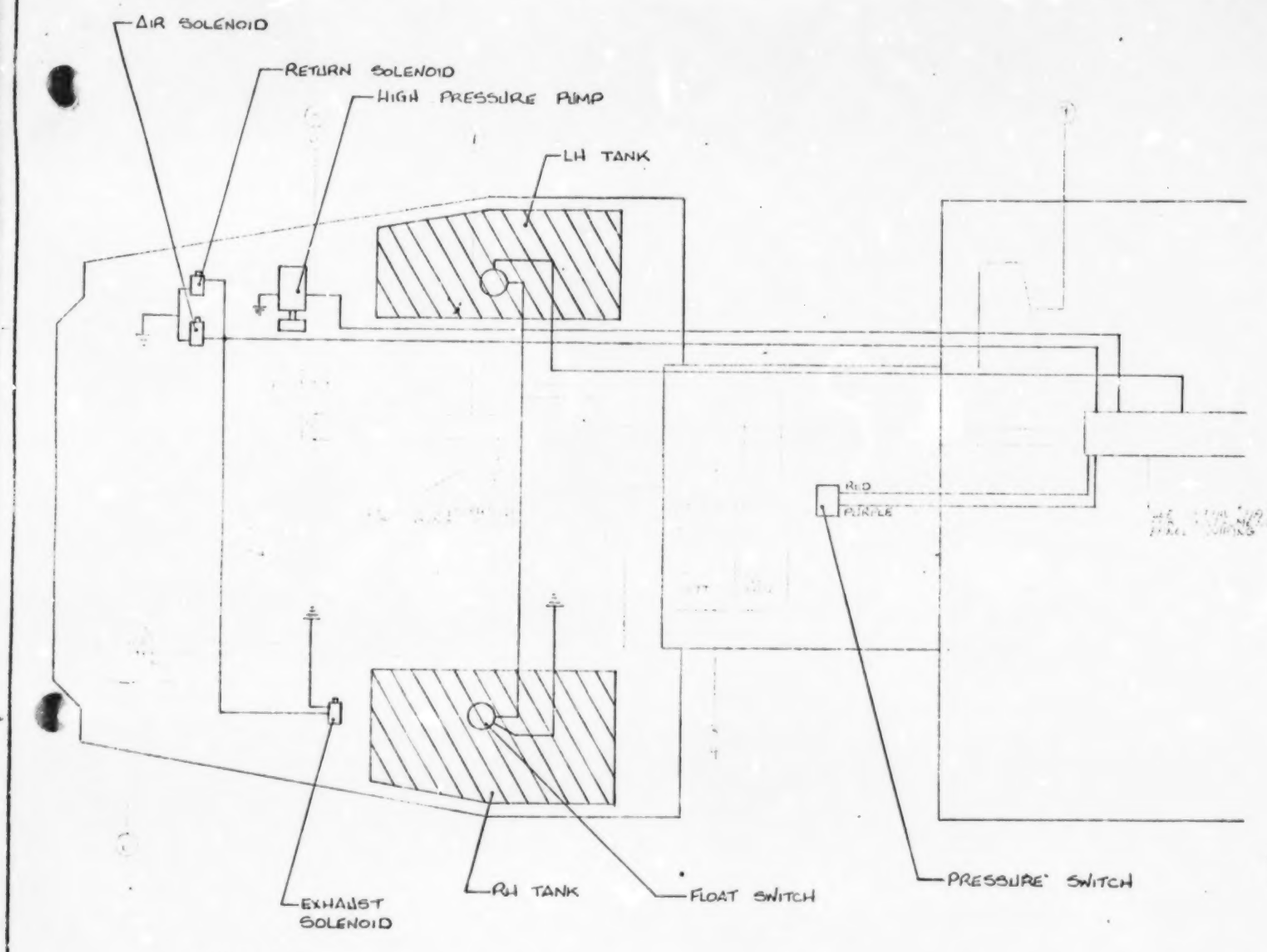
DO NOT SCALE DRAWING
GEN. SPECIFICATIONS

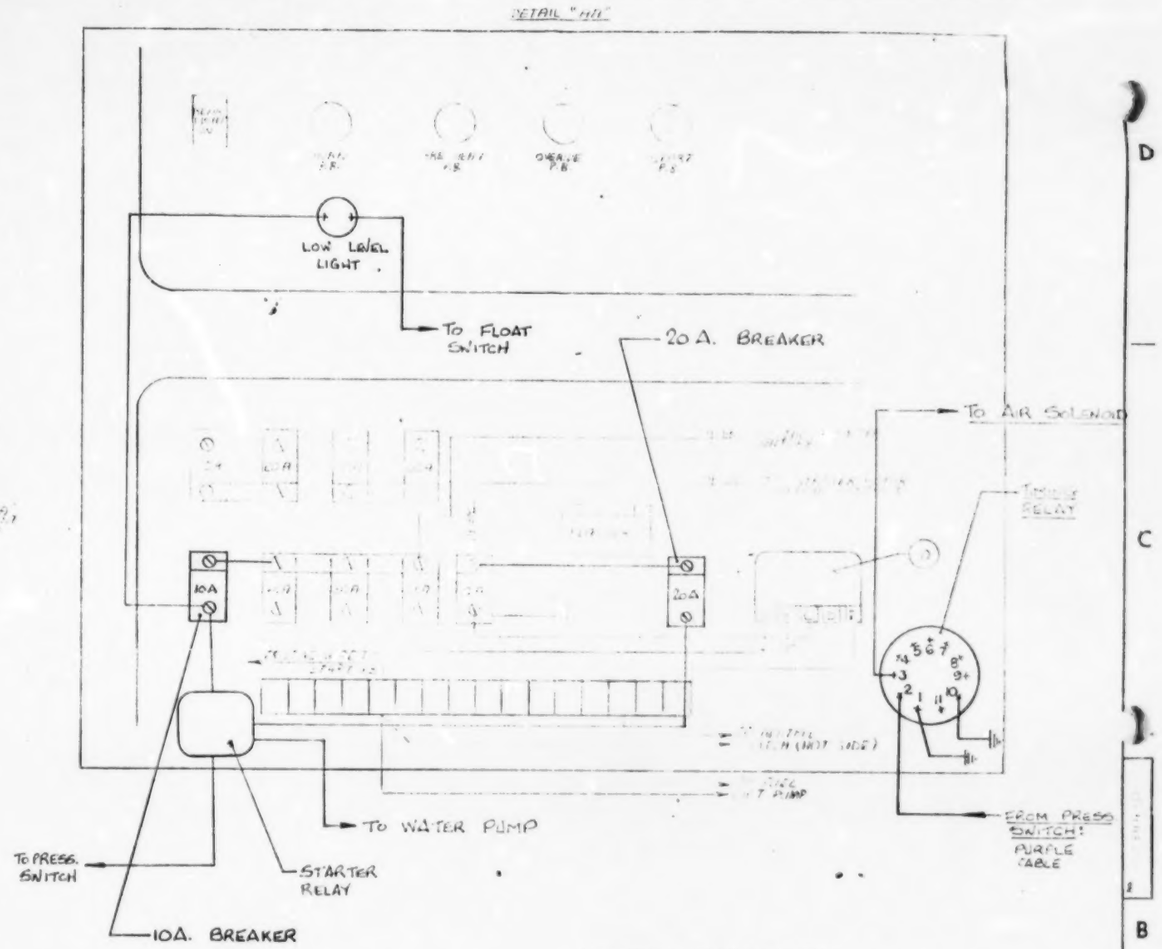
JARVIS CLARK
NORTH BAY ONTARIO

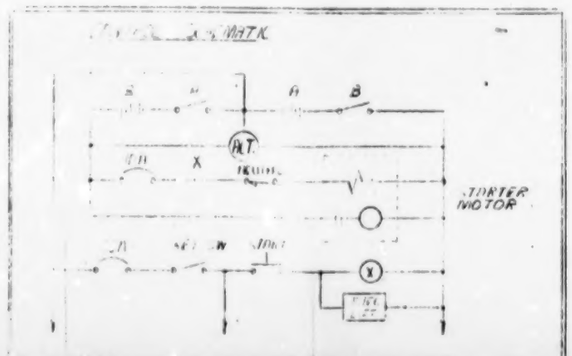
DR'N. BRANJE DATE 10.53
CHD. SCALE 1/4
WT.
USED ON CANMET

TITLE CANMET VENTURI EXHAUST INSTALL'N - R.H. SIDE VIEW

240088 -D







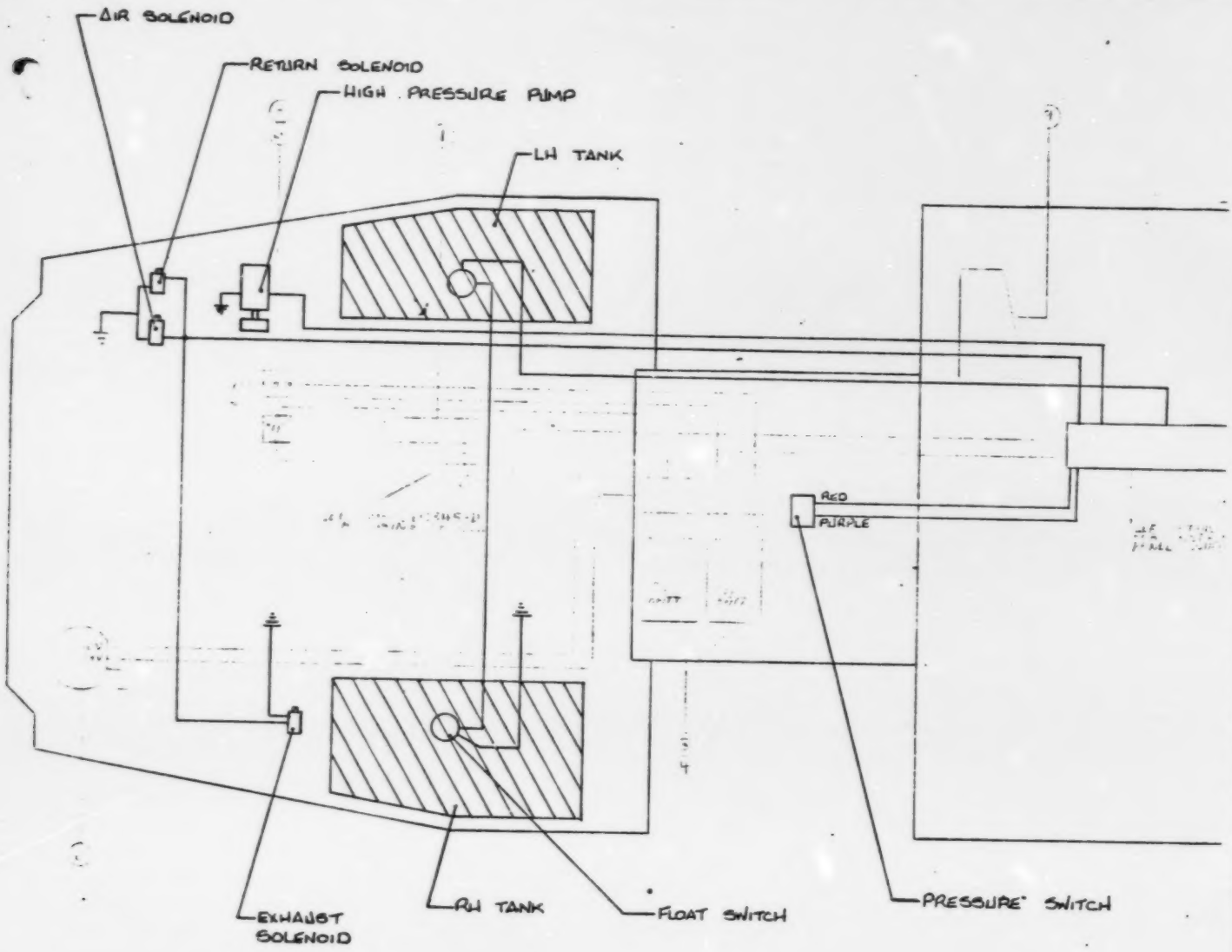
QTY.	ITEM NO.	PART NO.	DESCRIPTION	TEMP NO.
2	10	[illegible]	RELAY	
1	9	[illegible]	AIR PANEL SUB ASSEMBLY	
1	8	C35506-A	MISCONNECT HARNESS	
1	7	280945-D	LH VALVE ELECTRICAL HARNESS	
1	6	C35505-A	MISCONNECT HARNESS	
1	5	280692-D	10 AMP CIRCUIT BREAKER	
1	4	280698-D	MOUNTING BRACKET	
1	3	C3709	BATTERY	
1	2	[illegible]	[illegible]	

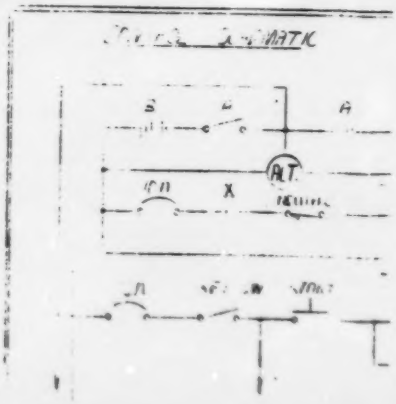
DO NOT SCALE DRAWING
GEN SPECIFICATIONS
UNLESS OTHERWISE SPECIFIED
INTERPRET THIS DRAWING AS PER CSA SPECIFICATION NUMBER B78.1
BREAK ALL SHARP EDGES
TOLERANCES — FRACTIONS ± 1/64 .00 ± .03 .000 ± .010 ANGLES ± 1°
FINISH —
MATL

JARVIS CLARK
NORTH BAY ONTARIO

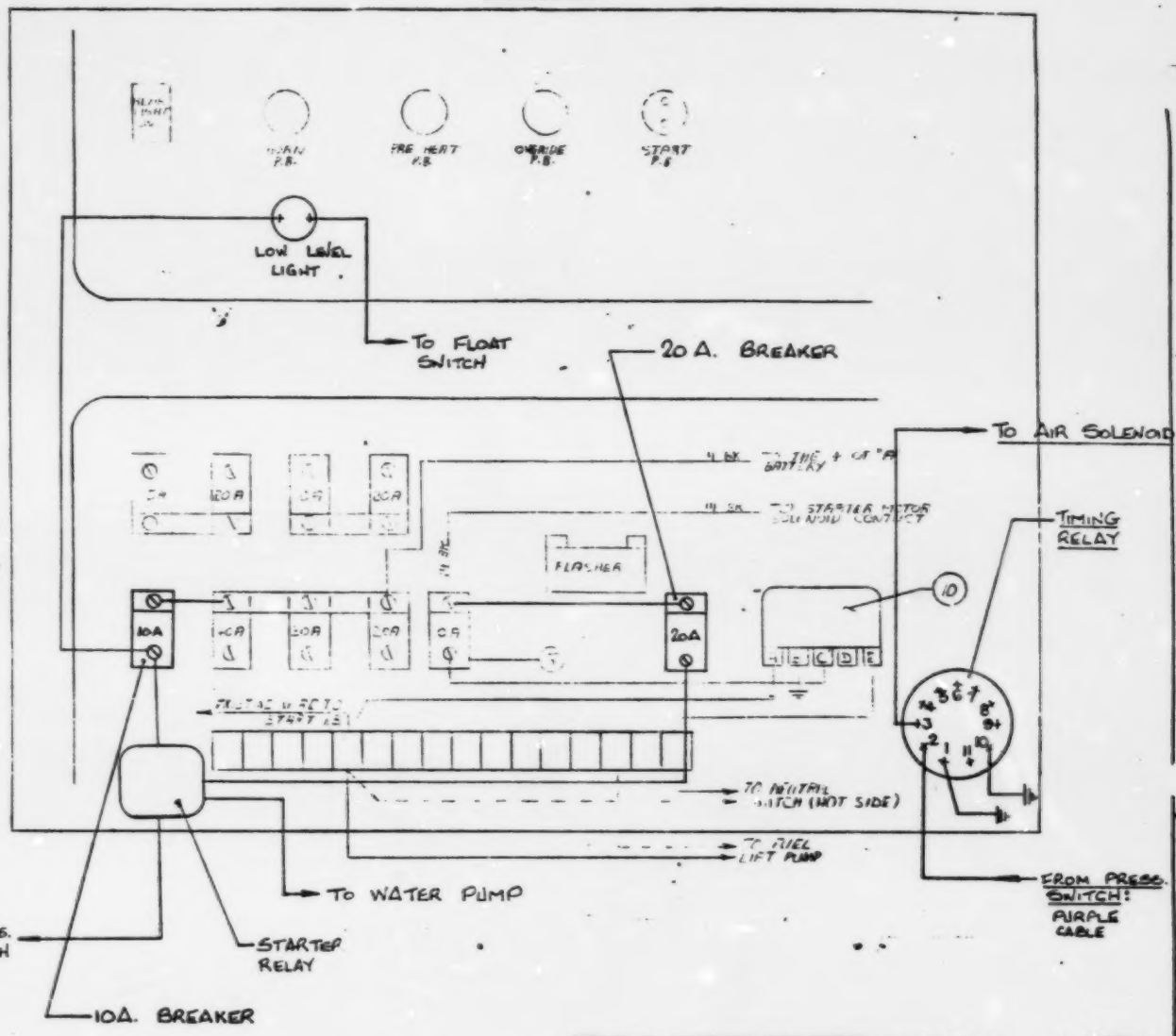
REV. NO.	ECN NO.	BY	DATE

DRWN. DATE
CHD. SCALE
APVD. WT.
NEXT ASSY
USED ON
APP. NO.
TITLE LH VALVE ELECTRICAL HARNESS
DRAWING

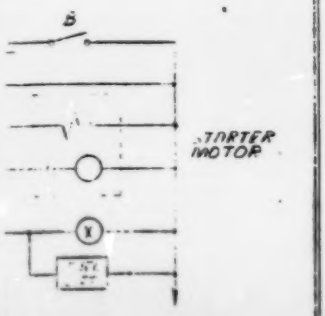

AIR SOLENOID
RETURN SOLENOID
HIGH PRESSURE PUMP
LH TANK
RED
PURPLE
EXHAUST SOLENOID
RH TANK
FLOAT SWITCH
PRESSURE SWITCH



DETAIL "AA"



QTY.	ITEM NO.	PART NO.	DESCRIPTION
1	10	111302-A	RELAY
1	9	220729-C	AIR PANEL SUB ASSEMBLY
1	8	219506-A	DISCONNECT BRACKET
1	7	220345-D	24 VOLT ELECTRIC START WIRING DIAGRAM
2	6	60545-A	DISCONNECT SWITCH
1	5	100632-A	10 AMP CIRCUIT BREAKER
1	4	220292-D	BATTERY BOX ASSY.
2	3	103708-A	BATTERY
1	2	60165-B	ALTERNATOR
		4674-A	24 VOLT ELECTRIC START



DO NOT SCALE DRAWING
GEN SPECIFICATIONS

JARVIS CLARK
NORTH BAY ONTARIO

24 VOLT ELECTRIC START
STATION LAY OUT

220344-D

POOR

QUALITY

ORIGINAL